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ABSTRACT

Designed to improve students' thinking, learning, and creative skills while they learn to program a microcomputer in BASIC programing language, this book for advanced learners at the junior high level provides a variety of microcomputer activities designed to extend the concepts learned in the accompanying instructional manuals (volumes 5 and 6). These activities require students to apply those concepts to challenging problems which need original and creative solutions. Each activity includes introductory information; a program to enter, run, and observe; and challenges to change or use the program. Titles of the individual activities are as follows: Trade Marks; Die Randomly; Chase It; Seating Charts; Sort of Sorting; Sorting; Alphabetizing; Math Designs; The Letter Connection; Three Letter Words; Four Letter Words; Letter Count; Keeping Tabs; Super Letter Count; Job Hunting; Letter Equality?; Databank; Lettercount2; Pick and Choose; Group Selection; Pick Only One; Paired with E; The Winning Pair; Ate or Eat or Etc.; Binary Lights; Hexadecimals Aren't Hexed; Your Number is Up; Time; Space Ship; and Something Very Special. (Author/LMM)

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THINKING · LEARNING · CREATING

TLC

MICROCOMPUTER PROJECTS

for Growing Minds

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Advanced Projects for Junior High

THINKING · LEARNING · CREATING

TLC

MICROCOMPUTER PROJECTS

for Growing Minds

Advanced Projects for Junior High

by Henry A. Taitt

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CREATIVE LEARNING ASSOCIATION, INC.
RR#4, Box 330
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Can you use the commands you have learned to solve complex problems? A complex problem is often nothing more than a collection of smaller problems, each of which can be solved. Many of the projects in this book will give you the experience you need.

Remember, there is no answer book. You must evaluate your solution and decide if it solves the CHALLENGE. Be hard on yourself. Do not be in such a rush that you pass over opportunities to learn and improve your skill.

If a program needs some changes to RUN without error on your computer, change it so it will RUN.

You are in command! Command well with pride in yourself and your ability.

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TRADE MARKS

INFORMATION

Many programmers create a logo which they include like a coat-of-arms or signature on the things they create. Our logo is the friendly robot TLC. Programs often start with a display that acts as a title page announcing the name of the program, the author, and the date it was created. It usually also contains the author's logo.

CHALLENGE

Using your best graphic skills, create a logo that will represent you. Use sound, color, graphics, motion, or whatever your computer does well.

CHALLENGE

Now create a fancy title page that contains your logo, your name, the name of your program and the date your program was created.

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DIE RANDOMLY

INFORMATION

Most computers have a way to create random whole numbers. Alter the program below if necessary to create 20 random whole numbers.

ENTER/RUN/OBSERVE

```
20 FOR T=1 TO 50
30 X=INT(7*RND(0))
40 PRINT X
50 NEXT T
```

CHANGE IT/RUN/OBSERVE

```
40 PRINT X,
```

CHALLENGE

Alter the program so only the whole numbers that are on a regular six-sided die will appear. Have your computer "roll" 1000 dies and display how often each number is selected.

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CHASE IT

INFORMATION

If you want to create a space game, here is a good place to start. Some commands that your computer does not understand have been used. You will need to make some changes.

CHALLENGE

Alter this program to RUN on your computer. It will need some de-bugging!

```
100 HOME
200 X=10:Y=20
300 SET(X,Y)
400 X$=INKEY$
500 IF X$="" THEN 40
600 IF X$="U" THEN Y=Y-1
700 IF X$="D" THEN Y=Y+1
800 IF X$="L" THEN X=X-1
900 IF X$="R" THEN X=X+1
1000 PLOT X,Y
1200 GOTO 40
```

When you have it working, SAVE it. Name it DRAW. Do not use line numbers less than 100.

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CHALLENGE

Using the program you saved named DRAW, add these lines.

```
 95 M=M+1
120 T=40*RND(0)
130 G=40*RND(0)
140 PLOT T,G
150 IF X=T AND Y=G THEN 300
160 GOTO 400
300 PRINT "YOU GOT IT IN ";M;" MOVES!"
```

If you have a TRS-80, add this.

```
 92 PRINT @ 490,X;" ";T;" ",Y;" ";G
```

Now EDIT out the semicolons and RUN it again.

SEATING CHARTS

INFORMATION

Often getting your teacher to change your seat in a class is not easy . . . unless you can produce a seating chart that is fair to everyone.

CHALLENGE

Create a program that will randomly find seats for 20 students in a 20-seat classroom.

Assign letters to the students (A to T) and numbers to the seats (1 to 20).

RUN your program several times.

SAVE it. Call it SEAT.

CHALLENGE

Change the program to fit your class. Use real student names. Make a printout for your teacher.

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SORT OF SORTING

INFORMATION

This is a program that will allow two words to be entered as INPUT, decide which comes first in the alphabet, and then print them in alphabetical order.

ENTER/RUN/OBSERVE

```
10 DIM A$(20)
20 DIM B$(20)
30 INPUT A$
40 INPUT B$
50 IF A$<B$ THEN 80
60 PRINT B$,A$
70 END
80 PRINT A$,B$
```

RUN several times. Try different words.

CHANGE IT/RUN/OBSERVE

Can you replace lines 10 and 20 with a single line?

CHANGE IT/RUN/OBSERVE

Can you replace lines 30 and 40 with a single line?

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CHANGE IT/RUN/OBSERVE

Will your computer understand this?

```
50 IF A$<B$ THEN PRINT A$,B$
80
```

CHANGE IT/RUN/OBSERVE

If you leave out the DIM statements, will your program RUN?

CHALLENGE

Find out how many letters you can use in each word that you INPUT and still not get an ERROR message. Include DIM statements if the number is greater than ten.

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SORTING

INFORMATION

If three words are to be placed in alphabetical order, more decisions must be made.

ENTER/RUN/OBSERVE

```
 10 DIM A$(20)
 20 DIM B$(20)
 30 DIM C$(20)
 40 DIM X$(20)
 50 INPUT A$
 60 INPUT B$
 70 INPUT C$
 80 IF A$>B$ THEN 200
 90 IF B$>C$ THEN 300
100 PRINT A$,B$,C$
110 END
200 X$=A$:A$=B$:B$=X$
210 GOTO 80
300 X$=B$:B$=C$:C$=X$
310 GOTO 80
```

RUN several times with different words.

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CHANGE IT/RUN/OBSERVE

Simplify this program for your computer. Try:

1) combining or eliminating lines 1Ø, 2Ø, 3Ø and 4Ø.

2) combining lines 5Ø, 6Ø, and 7Ø.

CHANGE IT/RUN/OBSERVE

Can your computer handle this?

```
************************************************
* 8Ø IF A$>B$ THEN X$=A$:A$=B$:B$=X$:GOTO 8Ø   *
************************************************
```

If so, do the same sort of thing with line 9Ø.

Then you won't need lines 11Ø, 2ØØ, 21Ø, 3ØØ and 31Ø.

CHALLENGE

Alphabetize five words that are entered as INPUT.

ANOTHER CHALLENGE

Change the above program to handle five words READ in as DATA and stored in an array.

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ALPHABETIZING

INFORMATION

If you have ten words to INPUT and alphabetize, try this. *(If you have an ATARI, go to page 11.)*

ENTER/RUN/OBSERVE

```
 20 DIM W$(11)
 30 FOR N=1 TO 10
 40 INPUT W$(N)
 50 NEXT N
 60 FOR T=1 TO 10
 70 FOR X=1 TO 10
 80 IF W$(X)>W$(X+1) THEN X$=W$(X):W$(X)=
W$(X+1):W$(X+1)=X$
 90 NEXT X
100 NEXT T
120 FOR P=2 TO 11
130 PRINT W$(P)
140 NEXT P
```

For a TI-99/4A, add these lines:

```
 80 IF W$(X)<W$(X+1) THEN 90
 81 X$=W$(X)
 82 W$(X)=W$(X+1)
 83 W$(X+1)=X$
```

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Skip to CHANGE IT/RJN/OBSERVE on the next page if you DON'T have an Atari. Since Atari handles arrays differently than most computers, it is a little more involved . . . but it can be done. Try this:

```
 10 DIM W$(31)
 15 DIM A(6,31)
 16 FOR N=1 TO 6
 17 FOR L=1 TO 30
 18 A(N,L)=0
 19 NEXT L:NEXT N
 20 FOR N=1 TO 5
 30 INPUT W$
 40 FOR L=1 TO LEN(W$)
 50 A(N,L)=ASC(W$(L))
 60 NEXT L
 70 NEXT N
 80 FOR T=1 TO 5
 90 FOR X=1 TO 5
 95 FOR L=1 TO 30
 96 IF A(X,L)=0 THEN 120
 97 IF A(X,L)=A(X+1,L) THEN 130
 99 IF A(X,L)<A(X+1,L) THEN 130
100 FOR Z=1 TO 30
101 IF A(X,Z)=0 AND A(X+1,Z)=0 THEN 130
(program continued)
```

```
102 S=A(X,Z):Z(X,Z)=A(X+1,Z):A(X+1,Z)=S
110 NEXT Z
120 NEXT L
130 NEXT X
140 NEXT T
150 FOR P=1 TO 6
160 FOR L=1 TO 30
165 IF A(P,L)=0 THEN 190
170 PRINT CHR$(A(P,L));
180 NEXT L
190 PRINT
200 NEXT P
```

CHANGE IT/RUN/OBSERVE

Change the program to handle fifteen words.

CHALLENGE

Can you change the program to handle N words, where you INPUT the value for N?

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MATH DESIGNS

INFORMATION

Making designs with numbers that have meaning can be interesting and challenging.

ENTER/RUN/OBSERVE

```
20 FOR C=1 TO 9
30 FOR T=1 TO X+1
40 PRINT T;
50 NEXT T
60 X=X+1
70 PRINT
80 NEXT C
```

CHALLENGE

Can you alter the program to produce this?

```
1
22
333
55555
88888888
```

Notice that 1+2=3, 2+3=5 and 3+5=8.

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THE LETTER CONNECTION

INFORMATION

When you pick up a book and start to read, a rather complex thing starts happening inside your head. Certain combinations of letters mean certain things to you while others mean nothing. You find that when these groups are separated by spaces and sprinkled with marks of punctuation, they can be used to express ideas and feelings.

Using a 26-letter alphabet, there are a fantastic number of possible groupings that could be formed. Since the order is important (RAT is different from TAR which is different from ART) even the number of possible two, three, and four letter words is quite large.

CHALLENGE

Create a program that will print out all possible combinations of two letters. Have your program count the combinations and print out the total at the end.

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CHALLENGE

Create a program that will print out and count all possible three letter words, using only A, B, C, and D. No two words can be exactly the same. Each letter can be used only once in a word.

SUPER CHALLENGE

Allow each letter to be used more than once.

Example:

AAA

AAB

ABA

BBB

-etc.-

SAVE this program. Name it AAA.

THREE LETTER WORDS

CHALLENGE

Using the 26 letters of the alphabet, create a program that will produce on a printer, all possible three letter words. Have your program count the number of words generated.

How many are words you know? Save your list and this program when you have it working.

Name it THREE.

Notice the following:

T	W	O
W	I	N
O	N	E

L	A	W
A	P	E
W	E	B

A	P	E
P	I	E
E	E	K

W	I	T
I	C	E
T	E	E

Can you create others using only real English words?

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FOUR LETTER WORDS

CHALLENGE

Now try the same thing with four letter words. Have your program count the number of words produced. Display or get a printout of all those words that start with X.

Take a look at the four letter words that start with X. What percent of them are words that you recognize? What percent are words that you can find in a large English dictionary?

It seems that in general usage, we do not make efficient use of all possible words! However, this might be a useful way to create new words for your adventure games or to name new science fiction creatures!

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LETTER COUNT

CHALLENGE

Create a program that will READ a string of DATA, and then count how often each letter was used. Your program should display results similar to the way shown below. As sample DATA use this:

```
DATA "THE QUICK BROWN FOX JUMPED OVER THE
      LAZY SLEEPING DOG."
```

RESULTS

A=1	B=1	C=1
D=2	E=6	F=1
G=2	H=2	I=2
J=1	K=1	L=2
M=1	N=2	O=4
P=2	Q=1	R=2
S=1	T=2	U=2
V=1	W=1	X=1
Y=1	Z=1	

SAVE your working program. Name it LCOUNT.

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KEEPING TABS

INFORMATION

Some computers can TAB somewhat like a typewriter.

Can your computer do this?

ENTER/RUN/OBSERVE

```
30 X=40*RND(0)
50 PRINT TAB(X)"*";
70 GOTO 30
```

CHANGE IT/RUN/OBSERVE

Remove the semicolon in line 50.

CHANGE IT/RUN/OBSERVE

```
50 PRINT TAB(X) CHR$(94)
```

CHALLENGE

Get the "space vehicle" to fill your screen.

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SUPER LETTER COUNT

CHALLENGE

Change your LCOUNT program so that it will (1) accept upper and lower case letters (if your computer produces lower case letters), (2) keep track of punctuation marks, (3) count the number of words used, and (4) count the number of sentences used. Have it display the results for you.

SAVE this program. Call it SLCOUNT (Super Letter COUNT).

Use the text of this page for DATA.

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JOB HUNTING

CHALLENGE

You are looking for a job. A good one is very hard to find. No one wants to hire you.

You go to a local merchant and tell him that the next time he wants to raise prices in his catalog, you can create a program that will READ in as DATA any document with prices expressed in dollars, and print out a document with all those prices increased by X% where X is a number he can INPUT.

He asks you to show him a sample and gives you this document to use as DATA.

Deluxe car coat	$96.48
Fur hat	$49.95

Do your stuff. Create a program that can do it. Try different values of X.

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LETTER EQUALITY?

INFORMATION

Let's take a look at words from a different point of view. In forming words, are all letters used equally? Do some authors use certain letters and certain words more often than other authors? Do some prefer short words while others like to use longer words? Let's use the computer to find out.

So far, we have only been looking at the 26 letters of the alphabet, but in the paragraph above, the space and the apostrophe (') were also found to be quite useful. Commas, periods and question marks were also used.

Perhaps we can ignore the punctuation marks, but we will certainly need to include the spaces.

Withoutthemitwouldbeveryhardtoreadanything.

So let's consider a 27 character set (26 letters and the space) and create a program that will take a passage as DATA and count the number of times each character occurs.

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Have your printout show the letter and how many times it occurred. You may want to distinguish between capitals and lower case letters.

On the next page, you will see a possible way this can be done, but you will have to make several changes so that it will work on your computer.

ENTER/RUN/OBSERVE

```
10 CLEAR 300
20 DIM A(122)
30 READ S$
40 IF VAL(S$)=999 THEN 400
50 L=LEN(S$)
60 FOR M=1 TO L
70 L$=MID$(S$,M,2)
80 N=ASC(L$)
90 A(N)=A(N)+1:C=C+1
100 NEXT M
110 GOTO 30
400 FOR P=32 TO 122 STEP 6
405 FOR T=P TO P+5
407 D$=" ":Q$="% %":R$="####"
(program continued)
```

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```
 410 PRINT USING R$;A(T),
 412 PRINT USING Q$;D$,CHR$(T),D$
 415 IF T=122 THEN 500
 420 NEXT T:PRINT
 425 NEXT P
 500 PRINT:PRINT "TOTAL NUMBER OF SYMBOLS=";C:END
1000 DATA"WHAT LETTERS ARE IN A WORD?"
1010 DATA"Let's take a look at words from a
different point of view."
1015 DATA"In forming words, are all letters used
equally?"
1020 DATA"Do some authors use certain letters
and certain words more often"
1025 DATA"than other authors?"
1030 DATA"Do some prefer short words while others
like to use longer words?"
1035 DATA"Let's use the computer to find out."
1040 DATA"Thus far we have only been looking at
the 26 letters of the alphabet,"
1045 DATA"but in the paragraph above, the spaces
and the apostrophe (') were"
1047 DATA"also found to be quite useful."
1050 DATA"Commas, periods and question marks were
also used."
1060 DATA"Perhaps we can ignore the punctuation
marks, but we will certainly"
1070 DATA"need to include the spaces."
1075 DATA"Withoutthemitwouldbeveryhardtoreadanyth
ing."
1080 DATA"So let's consider a 27 character set
(the 26 letters and the space)"
```

(program continued)

```
*1085 DATA"and create a program that will take a   *
*passage as DATA and count"                        *
*                                                  *
*1087 DATA"the number of times each character      *
*occurs."                                          *
*                                                  *
*1090 DATA"Have your printout show the letter      *
*and how many times it occurred."                  *
*                                                  *
*1095 DATA"You may wish to distinguish between     *
*capitals and lower case letters."                 *
*                                                  *
*1097 DATA"On the next page, you will see a        *
*possible way this can be done,"                   *
*                                                  *
*1100 DATA"but you may have to make several changes*
*so that it will work"                             *
*                                                  *
*1107 DATA"on your computer."                      *
*                                                  *
*1110 DATA"The sample results that will be shown   *
*will come from using this page"                   *
*                                                  *
*1115 DATA"as DATA."                               *
*                                                  *
*1120 DATA"999"                                    *
*                                                  *
****************************************************
```

The number of counted spaces may vary slightly depending upon how you entered the DATA.

If your computer does not understand PRINT USING, change those lines.

For those with an ATARI, remember what you tried earlier to examine each letter of a string.

STOP!

If you have finished all the BLUE projects, pat yourself on the back. You've done a good job!

NOW!

Before starting on the INDIGO projects, you'll need to learn some new commands from Volume 6 of TLC FOR GROWING MINDS. When you have finished that volume, come back and sharpen your skills with the INDIGO projects.

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DATABANK

INFORMATION

In an age of information, the ability to command a computer to examine and analyze words is very important. The series of projects that follows will not only give you the power to do this, but it will also stretch your ability to use the new commands you have learned.

This first project is to save a set of data that you will use in later projects. The data will be stored in lines 5000 to 5999 and will consist of six groups. The end of each group will be marked by a star (*).

Since different computers may allow a different number of characters per program line, you may need to make some changes in how many words you include with each line number.

When you have entered all of the data, save it under the name DATABANK. The first word in each group of DATA comes from Bloom's Taxonomy, and

represents increasing levels of understanding and intelligence. You will be using all of these levels of understanding in these projects. SAVE each of your solutions. They may be useful in the future.

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DATABANK

5100 DATA KNOWLEDGE, KNOW, DEFINE, MEMORIZE, REPEAT, RECORD, LIST, RECALL, NAME, RELATE, *

5200 DATA COMPREHENSION, RESTATE, DISCUSS, DESCRIBE, RECOGNIZE, EXPLAIN, EXPRESS, IDENTIFY, LOCATE, REPORT, REVIEW, *

5300 DATA APPLICATION, TRANSLATE, INTERPRET, APPLY, EMPLOY, USE, DEMONSTRATE, DRAMATIZE, PRACTICE, ILLUSTRATE, OPERATE, CALCULATE, SHOW, EXHIBIT, *

5400 DATA ANALYSIS, ANALYZE, DIFFERENTIATE, EXPERIMENT, COMPARE, CONTRAST, SCRUTINIZE, PROBE, INVESTIGATE, DISCOVER, INQUIRE, DETECT, INSPECT, EXAMINE, SURVEY, DISSECT, *

5500 DATA SYNTHESIS, COMPOSE, PLAN, PROPOSE, PRODUCE, INVENT, DEVELOP, DESIGN, FORMULATE, ARRANGE, ASSEMBLE, COLLECT, CONSTRUCT, CREATE, SET UP, ORGANIZE, PREPARE, GENERALIZE, ORIGINATE, PREDICT, CONTRIVE, CONCOCT, SYSTEMATIZE, *

5600 DATA EVALUATION, JUDGE, DECIDE, APPRAISE, EVALUATE, RATE, COMPARE, VALUE, REVISE, CONCLUDE, SELECT, CRITICIZE, ASSESS, MEASURE, ESTIMATE, INFER, DEDUCE, *

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LETTERCOUNT2

CHALLENGE

Load the DATABANK into your computer. Create a program using line numbers less than 5000 that will count the number of stars (*) in the DATABANK.

Add to your program so that it will count how many words are stored as data in the DATABANK. Name this program WORDCOUNT.

CHALLENGE

Change your program once more so that it will count how many letters are used. Name this program LETTERCOUNT2.

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PICK AND CHOOSE

CHALLENGE

Using the DATABANK, create a program that will display the first word from each group. Add to your program so that you can INPUT a number and then select the word that is in that position from each group.

Example:

3 DEFINE, DISCUSS, INTERPRET, DIFFERENTIATE, PLAN, DECIDE

CHALLENGE

Using the DATABANK, create a program that will select and display all those words that start with the letter C.

Have your program count the number of words selected and print them on a printer. If you do not have a printer to use, have them displayed in four columns on your screen. Add to your program so that you may INPUT the letter you want to select.

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GROUP SELECTION

CHALLENGE

Using the DATABANK, create a program that will allow you to INPUT the first word in any of the six groups. The rest of the words in that group should then be displayed in alphabetical order. Underline the selected word with a line or bar if you can.

Example:

KNOWLEDGE

DEFINE

KNOW

LIST

MEMORIZE

NAME

RECALL

RECORD

RELATE

REPEAT

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PICK ONLY ONE

CHALLENGE

Using the DATABANK, create a program that will allow you to display on your screen one of the six groups of data. Have a line drawn under the first word if you can.

Example:

COMPREHENSION

RESTATE

DISCUSS

DESCRIBE

RECOGNIZE

EXPLAIN

EXPRESS

IDENTIFY

LOCATE

REPORT

REVIEW

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CHALLENGE

Using all of the words in the DATABANK, create a program that will display each letter of the alphabet and how many times it was used in the DATABANK.

SUPER CHALLENGE

Can you get the above program to arrange the display so that the letter appearing most often is first, second most often second, and so on down the list?

PAIRED WITH E

CHALLENGE

Create a program that will check each word in the DATABANK and create a table of how often each letter in the alphabet occurs after the letter E.

EA 3

EB Ø

EC 9

ED 3

EE Ø

-etc.-

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THE WINNING PAIR

CHALLENGE

Create a program that will determine and display how often the following pairs of adjacent letters are found in the DATABANK.

IE

EI

CH

SS

Alter your program to check for other pairs.

SUPER CHALLENGE

Can you alter your program to check all pairs found and count how often each is found?

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ATE OR EAT OR ETC

CHALLENGE

Using the DATABANK create a program that will display all of the words that contain the word ATE.

Example:

RELATE

RESTATE

LOCATE

TRANSLATE

-etc.-

CHALLENGE

Create a program that will select from the DATABANK those words that do not have ATE together and in order, but do have all three letters present.

Example:

REPEAT

DRAMATIZE

-etc.-

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BINARY LIGHTS

INFORMATION

A light switch can either be ON or OFF. If OFF is represented by zero (Ø) and ON is represented by one (1), you have a binary counting system.

Notice how you can represent digits from Ø to 9 with a binary system.

LIGHTS	BINARY NUMBERS	BASE 1Ø NUMBERS
	Ø	Ø
	1	1
	1Ø	2
	11	3
	1ØØ	4
	1Ø1	5
	11Ø	6
	111	7
	1ØØØ	8
	1ØØ1	9

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CHALLENGE

Create a program that will display numbers in base 1Ø (our counting numbers) and spots of light in base 2.

If your computer supports color, have each column of lights a different color if possible.

HEXADECIMALS AREN'T HEXED

INFORMATION

Most microcomputers use hexadecimal numbers to communicate in machine language. This is a base sixteen system. Below is a program that will print out both base ten and base sixteen for the first sixteen numbers.

ENTER/RUN/OBSERVE

```
 50 DIM H(16)
 60 FOR X=0 TO 9
 70 H(X)=48+X
 80 NEXT X
 90 FOR X=10 TO 15
100 H(X)=X+55
110 NEXT X
200 FOR T=0 TO 15
210 IF H=16 THEN I=I+1:H=0
220 IF I=16 THEN J=J+1:I=0
230 IF J=16 THEN K=K+1:J=0
300 PRINT T,CHR$(H(K));CHR$(H(J));CHR$(H(I));
CHR$(H(H))
400 H=H+1
450 NEXT T
```

For TI, change lines 210, 220, and 230.

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Notice in hexadecimal (base sixteen) notation, A=1Ø, B=11, C=12, D=13, E=14, and F=15.

CHANGE IT/RUN/OBSERVE

Change the program to display thirty-two numbers. Notice each hexadecimal number.

CHANGE IT/RUN/OBSERVE

Change your program again so that it will continue displaying both decimal and hexadecimal numbers until you stop it.

Notice the hexadecimal numbers for the following decimal numbers.

16
256
4Ø96
65536

Have you noticed that 255 is the limit of many values accepted by your computer? (Example: The value of X in CHR$(X)) 255 is the largest number expressible by two digits in hexadecimal.

The largest number that can be expressed by four hexadecimal digits is 65535. Is that a limit of your computer?

CHALLENGE

Create a program that will accept as INPUT a hexadecimal number and then display its decimal equivalent. SAVE this program when you have it working.

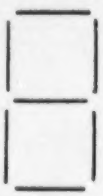
CHALLENGE

Create a program that will accept as INPUT a decimal number and display it on the screen as a hexadecimal number.

YOUR NUMBER IS UP

INFORMATION

On many electronic clocks, readout and score boards, a seven element light emitting diode (LED) is used. All numbers from Ø to 9 can be displayed by lighting some combination of these seven elements.



Notice that all seven parts are used to represent the number 8.

CHALLENGE

Create a program that will allow you to INPUT a digit from Ø to 9 and have the computer display that number like a LARGE LED in the center of the screen. SAVE this program. Name it NUMBER.

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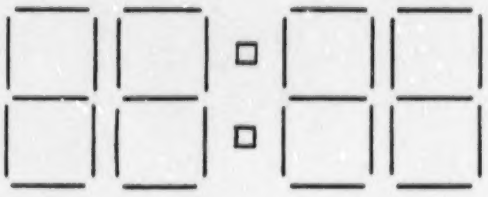
TIME

CHALLENGE

Using NUMBER as a guide, create a program that will cause the screen to act like a large digital clock.



SUPER CHALLENGE

Have the clock keep time.

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SPACE SHIP

CHALLENGE

Create a program that will draw a simple space ship on the screen. Have your space ship randomly appear on the screen but always move horizontally off the screen to the right.

Add a part to your program that will allow you to determine what direction it moves by pressing certain keys.

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SOMETHING VERY SPECIAL

INFORMATION

Most microcomputers have some feature that makes them special. It may be high-resolution graphics, shape tables, a music synthesizer, programmable function keys, speech capability, excellent color, special commands, split screen scrolling, extended character set, sprites, or some other trait.

CHALLENGE

Create a program that will display a birthday message for a friend. Use the special capabilities of your microcomputer to make it a special program.

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CONGRATULATIONS!

If you have reached this page, having solved all the projects in this book, you are an excellent problem solver and programmer.

You are a giant step ahead of most of the people your age. Continue to use your skills and understanding to stay out in front. Continue to improve your skills of learning.

Work towards being the best you can be!

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